72. (Amended) The method of claim 71, wherein a magnitude of the haptic feedback is increased in response to increases in the detected degree of force or pressure.

73. (Amended) The method of claim 71, wherein outputting haptic feedback includes simulating friction.

74. (Amended) The method of claim 71, wherein outputting haptic feedback includes outputting haptic feedback based on a velocity of the object in the x-y plane.

B' cont.

75. (Amended) The method of claim 71, wherein outputting haptic feedback is based on detecting a predetermined level of force.

76. (Amended) The method of claim 71, further comprising controlling an indexing function of said user interface device based on the detected degree of force.

Remarks

Reconsideration of this Application is respectfully requested. Upon entry of the foregoing amendment, claims 47-76 are pending in the application, with claims 47, 60 and 71 being the independent claims.

Claim Rejections Under 35 U.S.C. 103

Claims 47-50, 52, 54, 56-60, 71-73 and 75 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,642,469 to Hannaford et al. ("the Hannaford patent"). The Hannaford patent discloses a manipulator that can serve as an input device for controlling movement of a robot or other real or simulated device. The device of the Hannaford patent includes a planar disc that is movable in an x-y plane. A set of sensors coupled to the disc detect the movement. Force can be applied in the x-y plane in response to movement of the disc via

actuators coupled to the planar disc. The device is also configured to detect force in the z-direction by a separate set of sensors. Force can be applied in the z-direction via another set of actuators.

The invention as recited by independent claim 47 includes "a touchpad sensor configured to detect a position and motion of an object in an x-y plane, said touchpad sensor further configured to detect a degree of force applied to said touchpad sensor in a z-direction." The Hannaford patent fails to disclose a touchpad sensor that detects motion in the x-y plane as well as force in the z-direction. Moreover, the Hannaford patent fails to disclose "at least one actuator coupled to and spaced apart from said touchpad sensor." The actuators in the device of the Hannaford patent are co-located with the sensors.

The invention as recited by independent claim 60 includes "a touchpad sensor, spaced apart from the object, the touchpad sensor configured to detect motion of said object in the x-y plane, the touchpad sensor further configured to detect a degree of force applied to said touchpad sensor in a z-direction." As discussed above, the Hannaford patent fails to disclose a touchpad sensor that detects motion in the x-y plane as well as force applied in the z-direction. For at least this reason, claim 60 is allowable over the cited reference.

The invention as recited by independent claim 71 includes "detecting a position and motion of an object in an x-y plane using a touchpad sensor" and "detecting with the touchpad sensor a degree of force applied to the touchpad sensor in a z-direction" As discussed above, the Hannaford patent fails to disclose a touchpad sensor that detects motion in the x-y plane as well as force applied in the z-direction. Moreover, as discussed above, the Hannaford patent fails to disclose an "actuator being coupled to and spaced apart from the touchpad sensor." For at least these reasons, claim 71 is allowable over the cited references.

Dependent claims 48-50, 52, 54, 56-59, 72-73 and 75 are allowable at least due to their dependence upon independent claims 47, 60 and 71.

Claims 51, 53, 55, 61-70, 74 and 76 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Hannaford patent in view of U.S. Patent No. 6,111,577 to Zillies et al. ("the Zillies patent"). Dependent claims 51, 53, 55, 61-70, 74 and 76 are allowable at least due to their dependence upon independent claims 47, 60 and 71.

Claim Objections

Claims 46, 60 and 71 were objected to because of certain informalities. The Examiner suggests that the term "touchpad sensor" does not appear to be supported by the specification or the drawings. The Examiner further suggests that the term "touchpad" is "confusing within the context of the association this term has in the art." Applicants submit that the claimed "touchpad sensor" is supported by at least Figure 4f (illustrating touchpad sensor 161) and the corresponding description "Sensor 162 includes a planar sensor or "touch pad" 161..." (See U.S. Patent No. 6,191,774, the disclosure of which is incorporated by reference in the present application, at col. 18, line 66-col. 19, line 2).

Conclusion

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicants believe that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner

believes, for any reason, that further personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

COOLEY GODWARD LLP

Date: November 22, 2002 By: _____
Erik B. Milch
Reg. No. 42,887

COOLEY GODWARD LLP
11951 Freedom Drive
Reston Town Center
Reston, Virginia 20190-5656
(703) 456-8000 – Phone
(703) 456-8100 - Facsimile

Enclosure: Appendix indicating claim amendments

Claim Amendments

47. A device ~~engaged by a user for controlling a graphical cursor displayed by a host computer in communication with said user interface device, and for providing tactile feedback, said user interface device~~ comprising:

a ~~planar~~ touchpad sensor ~~able~~configured to detect ~~planar user~~a position and motion of an object in an x-y plane, said touchpad sensor ~~also~~further ~~able~~configured to detect a degree of force ~~or pressure~~ applied to said touchpad sensor ~~by said user~~ in a z-direction and to output at least one sensor signal, the sensor signal being based on the position of the object, the motion of the object and the detected degree of force; and

at least one actuator ~~providing tactile sensations~~coupled to and spaced apart from said ~~user~~touchpad sensor, said ~~at least one~~ actuator ~~controlled by software~~configured to receive a feedback signal from the computer and generate ~~said tactile sensations, said software controlling said actuator as a function of~~haptic feedback based on the feedback signal, the feedback signal being correlated with the sensor signal ~~a position of said cursor displayed by said host computer, and said software controlling said actuator also as a function of said detected degree of force or pressure applied to said touchpad sensor in said z direction~~.

48. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein ~~said software increases the~~a magnitude of ~~said tactile sensations in response~~the haptic feedback is proportional to ~~increases in~~ the detected degree of force ~~or pressure~~.

49. ~~A user interface~~The device ~~as recited in~~of claim ~~48~~48, wherein ~~said tactile sensations~~the haptic feedback is configured to simulate ~~a sense of~~ friction ~~for~~in the ~~user~~x-y plane.

50. ~~A user interface~~The device ~~as recited in~~of claim ~~48~~48, wherein ~~said tactile sensations are~~the haptic feedback is based on data values associated with a ~~simulated~~graphical representation of a pen ~~tip~~ drawing ~~graphical~~ objects ~~or shapes upon~~on a graphical display.

51. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein said ~~actuator~~sensor signal is ~~also controlled as~~further based on a ~~function of the~~ velocity of ~~user~~the ~~motion~~object in the x-y plane.

52. ~~A user interface as recited in~~The device of claim ~~48~~51, wherein ~~said tactile sensations are~~the haptic feedback is a texture ~~sensations~~sensation.

53. ~~A user interface~~The device ~~as recited in~~of claim ~~51~~52, wherein the ~~feel of said~~ texture ~~to said user~~sensation is modulated as a function of ~~both~~ the ~~applied pressure~~detected degree of force in the z-~~axis~~direction and the velocity ~~of user motion~~ in the x-y plane.

54. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein ~~said tactile sensations are deactivated when~~ the ~~user~~actuator is ~~not engaging said user interface with sufficient pressure~~configured to generate the haptic feedback if the detected degree of force exceeds a predetermined level.

55. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein ~~said~~the detected degree of force ~~or pressure in said z-direction~~ is ~~also used~~operative to control an indexing function of said ~~user interface~~ device.

56. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein said touchpad sensor ~~senses~~is configured to detect a contact location of ~~contact~~a pointer member, the pointer member being associated with ~~a pointer member having movement controlled by said user~~the object.

57. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, further comprising a linkage mechanism ~~coupling a user manipulatable~~configured to couple the object to said actuator, ~~wherein~~ said linkage mechanism ~~allows said user~~being configured to allow motion of ~~said user~~the object in ~~said~~the x-y plane.

58. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein ~~said user manipulatable~~the object is one of a mouse and a stylus.

59. ~~A user interface~~The device ~~as recited in~~of claim ~~47~~47, wherein said touchpad sensor is a planar photo diode.

60. A ~~user interface~~ device ~~engaged by a user for controlling a graphical cursor on a display of a host computer in communication with said user interface device, and for providing tactile feedback, said user interface device~~ comprising:

~~a user manipulatable object contacted by a user and moveable by said user in~~ an ~~x-y plane;~~

~~a planar touchpad sensor able to detect said motion of said user manipulatable~~ object movable in ~~said~~an x-y plane, ~~said touchpad sensor also able to detect~~the object being associated with a ~~degree~~graphical representation of ~~force or pressure applied to said touchpad sensor by said user in a z-direction; and~~

~~at least one actuator providing tactile sensations to said user, said at least one actuator controlled as a function of a position of said~~ cursor ~~and as~~;

a ~~function of said detected degree of force or pressure applied to said~~ touchpad sensor ~~in said z-~~ spaced apart from the object, the touchpad sensor configured to detect motion of said object in the x-y plane, the touchpad sensor further configured to detect a degree of force applied to said touchpad sensor in a z-direction; and

at least one actuator configured to provide haptic feedback to the object, the actuator being controlled based on the detected degree of force applied to said touchpad sensor.

61. ~~A user interface~~The device ~~as recited in claim 60~~of 60, further comprising a control processor ~~separate from said host computer, said~~configured to send a control ~~processor~~signal ~~controlling~~to said actuator to ~~output said tactile sensations~~generate the haptic feedback, ~~and wherein data derived from said~~the control signal being based on at least the detected degree of force ~~or pressure~~ applied to said touchpad sensor ~~is used by said control processor, at least in part, to compute said tactile sensations~~.

62. ~~A user interface~~The device ~~as recited in~~of claim ~~61~~60, wherein ~~said tactile sensations are~~the haptic feedback is provided in ~~said~~the x-y plane of ~~said user manipulatable~~the object ~~and~~, the haptic feedback being configured to include a damping sensation, a magnitude of ~~said~~the damping sensation being ~~dependent in part~~based on ~~said data derived from said~~at least the detected degree of force ~~or pressure~~applied to said touchpad sensor.

63. ~~A user interface~~The device ~~as recited in~~of claim ~~62~~62, wherein the damping sensation is proportional to the detected degree of force applied to said ~~damping sensation created by said actuators has a greater magnitude when said user is applying more pressure on said user object into said x-y plane and wherein said damping sensation created by said at least one actuator has a lesser magnitude when said user is applying less pressure on said user manipulatable object into said x-y planar workspace~~touchpad sensor.

64. ~~A user interface~~The device ~~as recited in~~of claim ~~61~~60, wherein ~~said tactile sensations include~~the haptic feedback includes a friction sensation, a magnitude of ~~said~~the friction sensation being ~~dependent in part~~based on ~~data derived from said~~at least the detected degree of force ~~or pressure~~applied to said touchpad sensor.

65. ~~A user interface as recited in~~The device of claim ~~64~~64, wherein the friction sensation is proportional to the detected degree of force applied to said ~~friction sensation created by said actuators has a greater magnitude when said user is applying more pressure on said user object into said x-y planar workspace and wherein said friction sensation created by said actuators has a lesser magnitude when said user is applying less pressure on said user manipulatable object in said x-y plane~~touchpad sensor.

66. ~~A user interface~~The device ~~as recited in~~of claim ~~61~~60, wherein ~~said feel sensation~~the haptic feedback is a texture sensation, ~~the~~a magnitude of ~~said~~the texture sensation being ~~dependent in part~~based on ~~data derived from said~~at least the detected degree of force ~~or pressure~~applied to said touchpad sensor.

67. ~~A user interface~~The device ~~as recited in~~of claim ~~66~~66, wherein the texture sensation ~~created by~~is proportional to the detected degree of force applied to said ~~at least one~~

~~actuator is stronger when said user is applying a greater amount of pressure on said user manipulatable object into said x-y plane and wherein said texture sensation created by said at least one actuator is weaker when said user is applying a lesser amount of pressure on said user manipulatable object into said x-y plane~~touchpad sensor.

68. ~~A user interface~~The device ~~as recited in~~of claim ~~61~~60, wherein said ~~user manipulatable~~ object is a mouse, and ~~wherein~~the detected degree of force applied to said touchpad sensor ~~measures how hard said user pushes down on~~is proportional to an external force received by a top surface of ~~said~~the mouse.

69. ~~A user interface~~The device ~~as recited in~~of claim ~~61~~60, wherein said ~~user manipulatable~~ object is a stylus, and ~~wherein~~the detected degree of force applied to said touchpad sensor ~~measures how hard said user pushes down on said~~is proportional to an external force received at the stylus.

70. ~~A user interface~~The device ~~as recited in~~of claim ~~60 wherein data corresponding to said detected degree of force or pressure is also used to monitor safety,~~61, wherein said control processor ~~limits said force output from said at least one actuator~~is configured to send the control signal when ~~said user is not pushing down on said user manipulatable object with sufficient~~the detected degree of force is at a predetermined level.

71. A method ~~for providing tactile feedback, using a user interface device engaged by a user for controlling a graphical cursor displayed by a host computer in communication with said user interface device, the method~~ comprising:

detecting ~~planar~~ a position and a motion of ~~a user manipulatable object in~~ an object in an x-y plane using a touchpad sensor;

detecting with ~~said~~the touchpad sensor a degree of force ~~or pressure~~ applied to ~~said~~the touchpad sensor ~~by said user~~ in a z-direction; ~~and~~

~~providing tactile sensations to said user using at least one actuator of said user interface device, said actuator~~receiving a feedback signal from a computer, the feedback signal being ~~controlled as~~based on data values associated with a ~~function~~position of a ~~position~~graphical representation of ~~said~~a cursor~~,~~ controllable by the object; and ~~controlled as a function of said degree of force or pressure applied to said~~

outputting haptic feedback to the object via an actuator, the actuator being coupled to and spaced apart from the touchpad sensor ~~in said z direction~~, the actuator configured to output haptic feedback correlated with the feedback signal.

72. ~~A~~The method ~~as recited in~~of claim ~~71~~71, wherein ~~the~~a magnitude of ~~said tactile sensations~~the haptic feedback is increased in response to increases in the detected degree of force or pressure.

73. ~~A~~The method ~~as recited in~~of claim ~~71~~71, wherein ~~said tactile sensations simulate a sense of~~outputting haptic feedback includes simulating friction ~~for the user~~.

74. ~~A~~The method ~~as recited in~~of claim ~~71~~71, wherein ~~said actuator is also controlled as~~outputting haptic feedback includes outputting haptic feedback based on a ~~function of the~~ velocity of ~~user~~the ~~motion~~object in the x-y plane.

75. ~~A~~The method ~~as recited in~~of claim ~~71~~71, wherein ~~said tactile sensations are deactivated when the user~~outputting haptic feedback is ~~not engaging said user interface with sufficient pressure~~based on detecting a predetermined level of force.

76. ~~A~~The method ~~as recited in~~of claim ~~71 wherein said degree of force or pressure in said z direction is also used to control~~71, further comprising controlling an indexing function of said user interface device based on the detected degree of force.